IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Olgica BAKAJIN, et al.
Title:	MICROFLUID SIEVE USING INTERTWINED FREE-STANDING CARBON NANOTUBE MESH AS MEDIUM
Appl. No.:	10/613,960
Filing Date:	7/3/2003
Examiner:	Menon, Krishnan S.
Art Unit:	1723
Conf. No.:	6753

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The applicants provide a summary of their argument for (i) why an essential element is missing from the Examiner's rejection, and (ii) why clear error is present in the motivation to combine references.

Independent Claims 1 and 45 per last Amendment:

1. (currently amended) A microfluidic sieve comprising:

a substrate having a microfluidic channel; and

a[n elastically] compressed carbon nanotube mesh comprising a plurality of intertwined free-standing carbon nanotubes fixedly attached within and randomly extending from the surface of said channel to form irregularly sized mesh pores between the intertwined nanotubes for separating, concentrating, and/or filtering molecules flowed therethrough; and

a cover layer sealably capping said microfluidic channel to thereby pack and [elastically] compress the carbon nanotube mesh in the microfluidic channel.

45. (currently amended) A method of separating, concentrating, and/or filtering molecules comprising:

flowing molecules through a microfluidic channel having a[n elastically] compressed carbon nanotube mesh comprising a plurality of intertwined freestanding carbon nanotubes fixedly attached within and randomly extending from the surface of said channel to form irregularly sized mesh pores between the intertwined nanotubes, and a cover layer sealably capping said microfluidic channel to thereby pack and [elastically] compress the carbon nanotube mesh in the microfluidic channel, whereby said [elastically] compressed carbon nanotube mesh operates as an active medium for separating, concentrating, and/or filtering said molecules.

Independent claims 1 and 42, and many claims dependent thereon, were rejected under 35 U.S.C. § 103(a) as unpatentable over Dai *et al.* (2004/0149209) in view of Noca *et al.* (US 6,685,810). However, there is no motivation to combine the references, and every element of the present invention as claimed is not present even if the references are combined for sake of argument. **Clearly, the Examiner has not shown a cover layer which seals and caps the channel and also compresses the carbon nanotube mesh.**

The applicants initially focus on independent claim 1. Dai *et al.* ("Dai") fails to describe various features of the presently claimed inventions including, for example:

(a) a substrate having a microfluidic channel;

(b) a compressed carbon nanotube (CNT) mesh fixedly attached within the microfluidic channel; and

(c) a *cover layer sealably capping the channel to compress the carbon nanotube mesh*.

These elements are important because, for example, they provide for pressure driven flow through the microfluidic channel. See, for example, the specification at page 12 describing "pressure driven flow" applications and claim 46. Moreover, flow is not just through a mesh but through a *compressed* mesh. This helps prevent "producing a gap between the mesh and the cover" as described in the specification at page 10, [0031]. The references cited by the Examiner do not individually or in combination provide for pressure driven flow, and they also do not provide a compressed mesh.

The Examiner cited Noca to compensate for the many Dai deficiencies. In particular, the Examiner cites to the cap layer in Noca as being the cover layer which compresses the carbon

nanotubes (col. 10, line 47 – col. 11, line 2, element 66). However, the Noca capping layer is clearly NOT "a cover layer sealably capping the channel to compress the carbon nanotube mesh." **The Noca cap layer does not seal; the Noca cap layer does not compress nanotubes**. The applicants could not find the claimed aspect in the teachings of Noca. More particularly, Noca describes that the capping layer is formed in a vaguely described deposition or growth step which is not explained in any detail to provide sufficient enablement to reach the present claims. No figures are provided to clarify this vague description. One of ordinary skill would not take from this Noca teaching that the cap layer compresses the carbon nanotubes or forms a seal. This is not surprising as Noca does not describe or suggest pressurizing the flow channel and therefore does not teach or suggest a seal. The flow processes in Noca through the channel are not pressurized, and it has not been shown where the flow is pressurized, or where the cap layer provides a pressure seal. Hence, even if the references are combined for sake of argument, the presently claimed inventions are not arrived at. Hence, no prima facie obviousness is present because a missing claim element is present in the record.

Moreover, no motivation is present to combine these references. Dai merely describes manufacturing generally disordered CNT mesh which runs directly against the Noca teaching for an *ordered* array of CNT pillars. Noca leads away from the claimed random mesh. Dai only vaguely and without detail describes use of materials for molecular filtration membranes, but Dai does not provide any specific teaching to use the materials in an ordered arrangement in a *device* as required by Noca. The Examiner needs to consider the *total* teachings of the references

including motivation to NOT combine the references. In this record, the motivation to not combine references cuts against prima facie obviousness, and clear error is present.

The applicants appreciate the Examiner's willingness to review the issues and allow a more narrow dependent claim. However, the Examiner's position does not provide the particularity or clarity needed to establish prima facie obviousness. Generic positioning about skill in the art is not enough. The case law is clear that each element must be accounted for, and both motivation for and motivation against combining references must be considered. **Clearly, the Examiner has not shown a cover layer which seals and caps the channel and also compresses the carbon nanotube mesh.**

Respectfully submitted,

Date March 19 2007

By _____

J. Steven Rutt
Registration No. 40,153

S. Isaac Zaghi
Registration No. 55,951

FOLEY & LARDNER LLP
Customer Number: 22428
Telephone: 202-672-5351
Facsimile: 202-672-5399